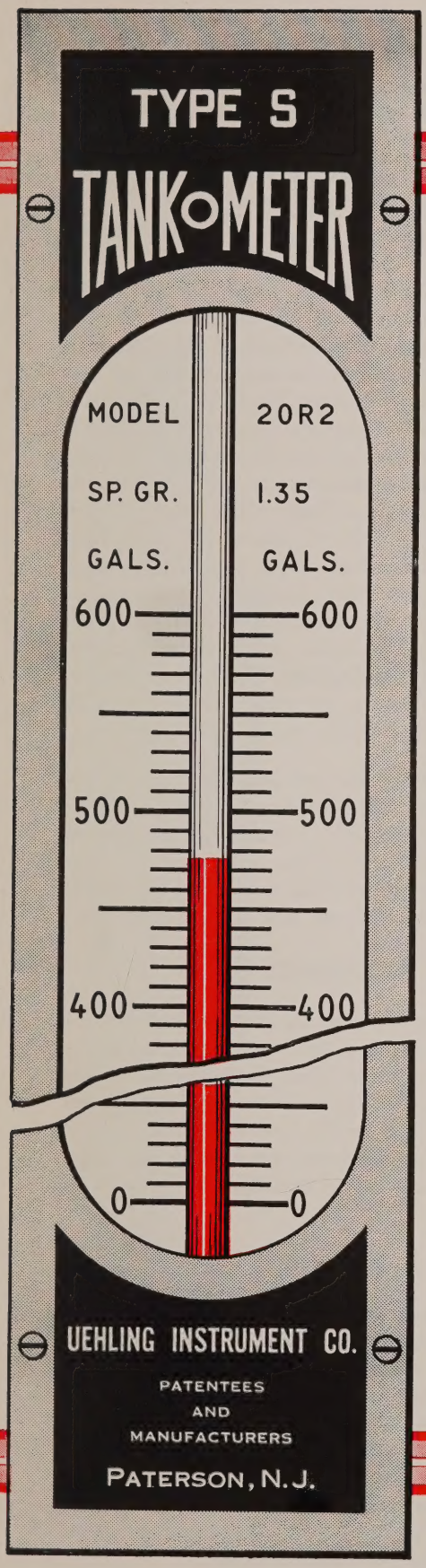
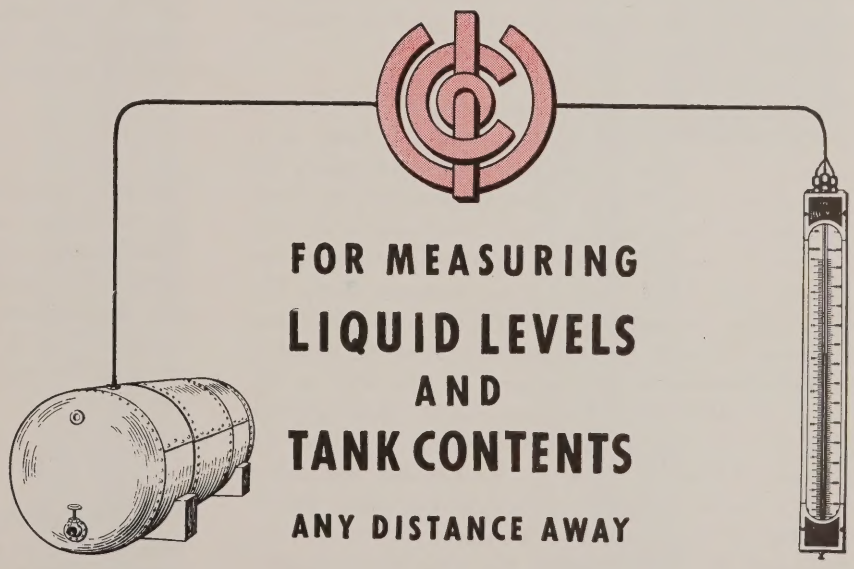


Actual Size

Uehling TANK-O-METER



FOR MEASURING
LIQUID LEVELS
AND
TANK CONTENTS
ANY DISTANCE AWAY

UEHLING INSTRUMENT CO.
PIONEER MANUFACTURERS OF HYDROSTATIC INSTRUMENTS
PATERSON NEW JERSEY

TANK-O-METER

For Measuring Tank Contents Any Distance Away

BULLETIN NUMBER 945

FIFTY years experience in the manufacture of hydrostatic instruments has placed the Uehling Instrument Company in an authoritative position with respect to depth gauges that meet the present day demand for accuracy and dependability. This instrument, known as the **Tank-O-Meter,** makes it possible to accurately measure the contents of tanks at any remote point, regardless of where the tanks themselves may be located. **Tank-O-Meters** are, therefore, particularly well suited for the very stringent requirements in the Chemical and Oil Industries for keeping close tabs on purchases, distribution, and consumption.

Type S **Tank-O-Meter** meets the most exacting requirements of modern engineering practice and combines extreme accuracy, reliability, and durability with an exceptionally attractive appearance. Each **Tank-O-Meter** is made of durable Aluminum with a glass front which provides exceptional legibility as illustrated in Figures 1, 2, and 3. The neat and attractive design is particularly appealing when the instruments are located in the office or at any other central point at a distance from the tanks which they serve.

It was the accuracy and dependability of the **Tank-O-Meter** as experienced in the industrial field which prompted the United States Government to specify this type of instrument for all Naval Combat and Maritime Commission Vessels such as Super-dreadnaughts, Aircraft Carriers, Cruisers, Destroyers, Floating Drydocks, Cargo Vessels, Tugs, Mine Layers, Mine Sweepers, Army and Navy Troop Transports, Landing Crafts, Seaplane and Destroyer Tenders. As a typical example of the flexibility of **Tank-O-Meters** it is of interest to note that on the "U. S. S. MISSOURI" there are two hundred and ten (210) Uehling **Tank-O-Meters** installed for measuring the contents of Fuel Oil, Lube Oil, Fresh Water, and Ballast Tanks in scattered location throughout the vessel. Nearly ten miles of copper tubing was necessary to connect the Tanks with the **Tank-O-Meters**, the latter being mounted on centrally located panel boards.

A LARGE CHOICE OF MODELS

Type S **Tank-O-Meters** are built in fifty-two different standard models for measuring liquid depths ranging from 12 inches to 900 inches (see table Page 7). This provides a flexibility which permits a large number of ranges from which the customer may choose. Special ranges may, however, also be provided should this become necessary. Four indicating fluids of different specific gravities are available to the customer, Red Indicating Fluid No. 1, Red Indicating Fluid No. 2, Red Indicating Fluid No. 3, and Mercury. This makes it possible to provide a gauge most suitable for any specific conditions. Type S **Tank-O-Meters** may be calibrated in units of depth, such as inches or feet, units of weights, such as pounds or tons, or units of volume, such as gallons, barrels, drums, or cubic feet. When **Tank-O-Meters** are calibrated in units of linear depth, such as inches or feet, the only information required is the maximum depth to be measured, kind of liquid, and its specific gravity. However, when the **Tank-O-Meter** is to be calibrated in units of weight or volume, we must have all the inside dimensions of the tank or the tank capacity chart.

Tank-O-Meters can also be furnished with high or low level contactors for closing or opening electric circuits at any predetermined levels. This makes it possible to automatically actuate high or low level alarms, and to actuate pumps, motors, or valves, as required to automatically establish predetermined tank level conditions.

ACCURACY

Permanent accuracy is insured by the hydrostatic principle (see Page 6) and the extreme care utilized when the **Tank-O-Meter** is calibrated. Each **Tank-O-Meter** is provided with a scale specially made to suit the particular tank involved and the specific gravity of the liquid it contains. Type S **Tank-O-Meters** consequently lend themselves to the measurement of any liquid which seeks its own level.

APPLICATION

Tank-O-Meters are suitable for any tanks regardless of their location, or whether the tank is open, vented, under pressure, or under vacuum. They may be applied to the **measurement of Acids, Water, Oil, Gasoline, Alcohol, Solvents, Beverages, Alkalis, Tar, Molasses, Milk, Paints, Varnishes, Sodium Silicate, Formaldehyde, or any other chemical solution. Tank-O-Meters** may also be used to measure any other depth such as Tide Waters, Depth of Rivers, Wells, Tail or Head Race Levels, Draft of Ships, Ballast Tanks, Drydock Compartments, etc.

ACTUAL TANK-O-METER PHOTOGRAPHS

Fig. 1. Hand pump actuation; Fig. 2. Compressed air actuation; Fig. 3. Compressed air actuation with automatic switch for actuating high or low alarm, or for actuating pumps or valves to maintain predetermined high or low levels.

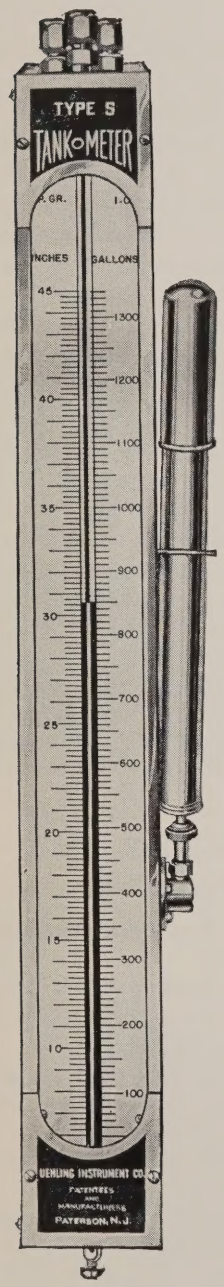


FIGURE 1

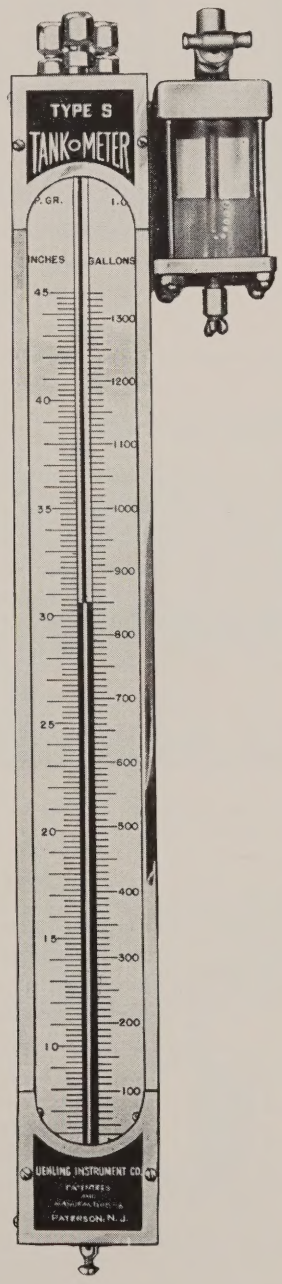


FIGURE 2

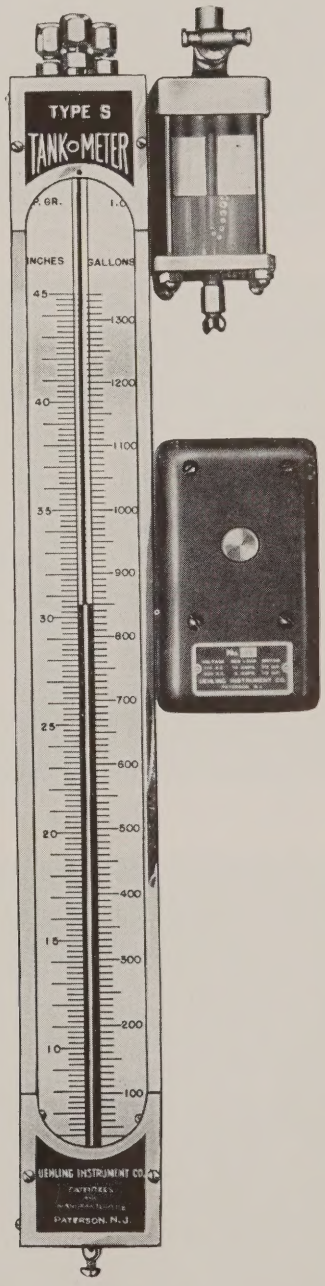


FIGURE 3

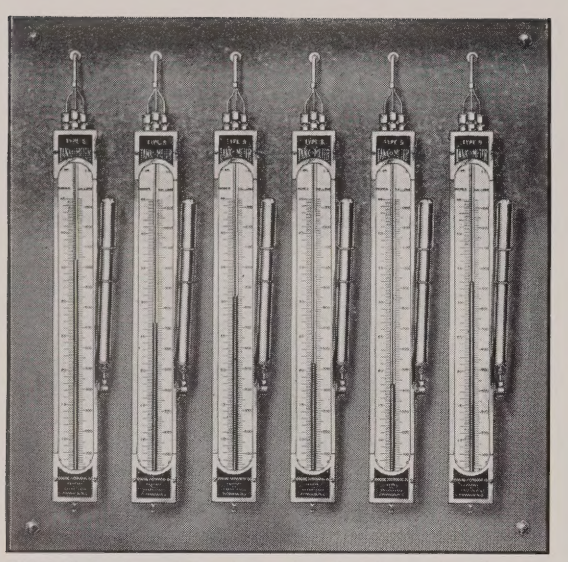


FIGURE 4—Typical Panel Board Tank-O-Meter Installation with Hand Pump Actuation.

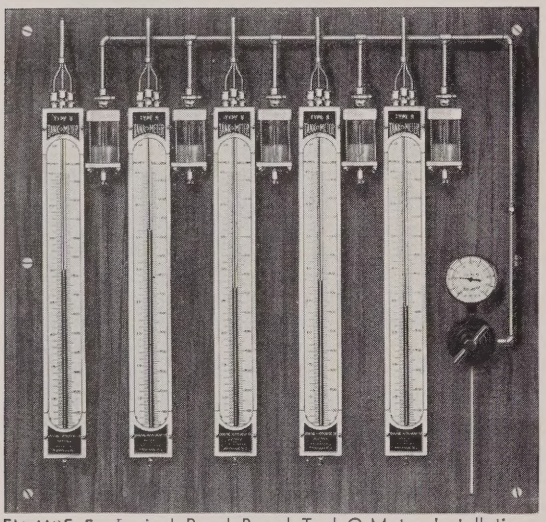


FIGURE 5—Typical Panel Board Tank-O-Meter Installation with Compressed Air Actuation.

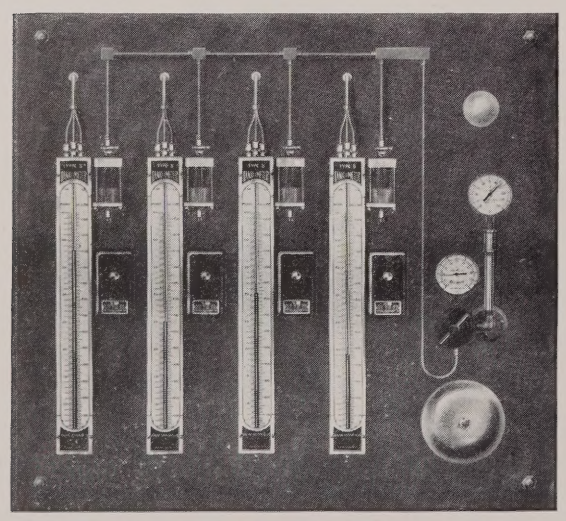


FIGURE 6—Typical Panel Board Tank-O-Meter Installation with Compressed Air Actuation and Automatic High Level Alarm.

FLEXIBILITY

Uehling **Tank-O-Meters** lend themselves to an unlimited variety of applications, some typical examples of which are illustrated on the opposite page. When **Tank-O-Meters** are to be installed in some central location, they can be furnished completely assembled on panel boards, some actual examples of which are illustrated in Figures 4, 5, and 6. Panel board assemblies can be furnished for actuation by hand pump, compressed air, and with various combinations of automatic level alarms and regulators as illustrated.

As previously stated, **Tank-O-Meters** can be calibrated in units of depths, such as inches or feet, in units of volume, such as cubic feet, gallons, drums or barrels, or in units of weight, such as pounds, tons, etc. In this connection, it should be particularly noted that for a vertical cylindrical tank or for any tank with parallel sides, the **Tank-O-Meter** when calibrated in units of weight, measures the correct contents even when various liquids of different specific gravities are placed in the tank. For example, it is possible to feed liquids of different specific gravities into a mixing tank and by means of a **Tank-O-Meter** establish the exact mixture required. As illustrated in Figure 9 on the opposite page, any weight of liquid as measured by a single **Tank-O-Meter** at the left can be fed into a mixing tank from any one or more of the tanks on the floor above as required to produce any desired mixture. A similar example is that of a concentration tank in which a given weight of liquid may be boiled down or evaporated until the desired degree of concentration, as measured by the **Tank-O-Meter,** has been obtained.

Special sanitary tank fittings can be furnished when measuring the contents of tanks containing milk, ice cream mix, soups, beverages, or any other liquid food products.

SOME IMPORTANT REASONS FOR INSTALLING TANK-O-METERS

The most practical and accurate means for measuring Tank Contents.

A continuous knowledge of Tank contents is provided.

Interruptions due to lack of supply are avoided.

Purchases can be checked with accuracy.

Readings before and after draw-offs determine amount used, thus facilitating accurate cost checking and eliminating waste.

Personal hazards due to corrosive acids, fumes, hot liquids, climbing tanks, etc., are avoided.

Tank-O-Meter may be located any distance from Tank.

The contents of a Tank can be measured by two or more Tank-O-Meters located in different parts of the plant.

Errors and negligences due to the human equation are eliminated.

Proper ratios can be determined in mixing processes.

Degree of concentration can be determined in evaporation processes.

A FEW TYPICAL ILLUSTRATIONS

SHOWING VARIOUS TYPES OF TANK-O-METER INSTALLATIONS

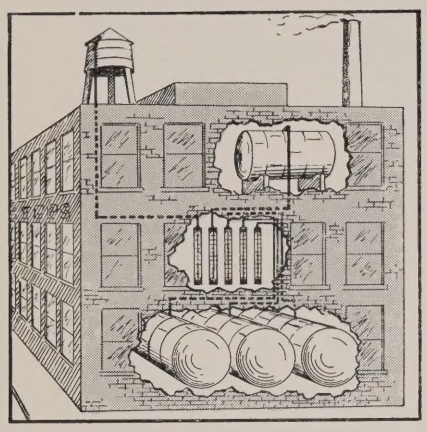


FIGURE 7—Showing tanks at different elevations with respect to centrally located Tank-O-Meters.

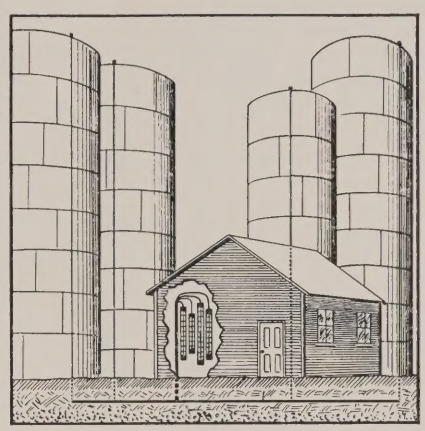


FIGURE 8—A farm of different sized vertical cylindrical tanks serviced by Tank-O-Meters.

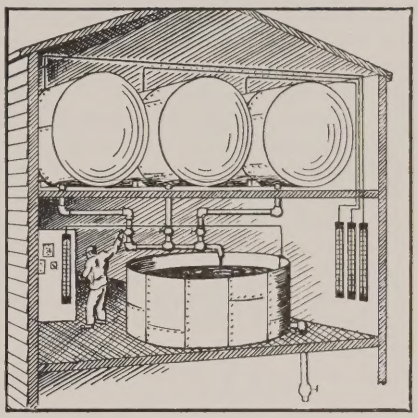


FIGURE 9—A complete measuring system for a mixing tank fed from three supply tanks.

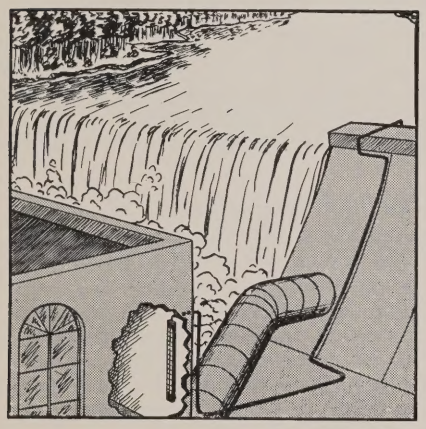


FIGURE 10—Measuring waterhead at the dam of a Hydro-electric Plant. Tank-O-Meter located in the power house.

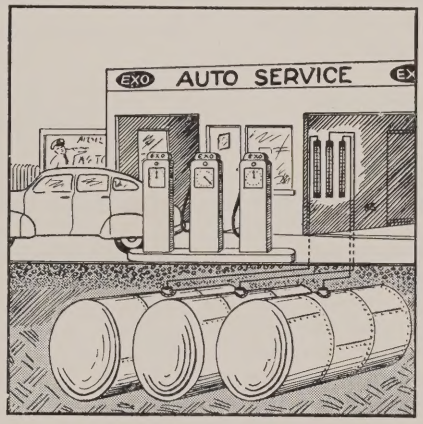


FIGURE 11—Keeping tabs of purchases and sales at a gas station where tanks are buried.

FIGURE 12—Typical water tower installation with connections to Tank-O-Meter buried.

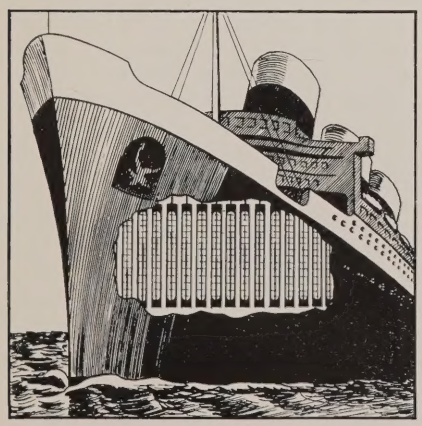


FIGURE 13—Centrally located Tank-O-Meters for measuring contents of Fuel Tanks, Water Tanks, Ballast Tanks & Draft.

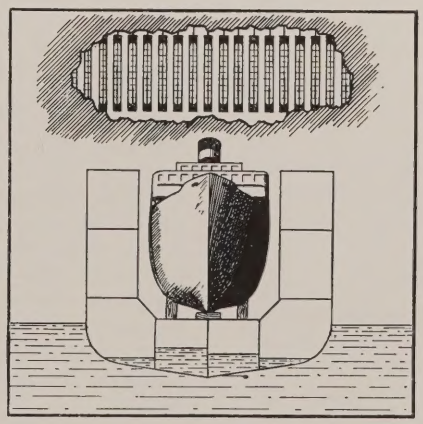


FIGURE 14—Centrally located Tank-O-Meters for measuring draft and water in all compartments of a drydock.

FIGURE 15—Modern locomotive equipped with Tank-O-Meters for Fuel, Oil and Water Tanks.

Hydrostatic Principle Insures Accuracy and Dependability

The hydrostatic principle is the most accurate method known for measuring pressures. This principle is utilized in the **Tank-O-Meter** in a very simple manner to measure the contents of tanks. Pressure pipe (7) is inserted into the liquid as illustrated. By means of an air pump (2), air is forced into the pipe (7) through connection (B), while the pressure in pipe (7) is measured by the indicating column (9) through connection (A). As the pump (2) is actuated, the pressure in pipe (7) will obviously increase only until said pressure is equal to the head (h), after which any additional amount of air pumped into pipe (7) will merely bubble out through the opening at (13). The indicating column (9) will therefore continue to rise only to a point corresponding to the head (h), after which continued pumping will have no further effect on the reading. A check valve in the pump line prevents any dissipation of the pressure thus obtained. When compressed air is available, the pump may be entirely eliminated. A third connection (C) connects the space above the liquid in the tank with the top of the indicating column (9), thus avoiding the possibility of any errors, if, at any time, the tank is under pressure or vacuum. In other words, regardless of the pressure or vacuum existing in the space above the liquid in the tank, the **Tank-O-Meter** will measure the head (h) which can be calibrated in units of depth, volume, or weight.

GENERAL INSTALLATION METHOD

A three line cable containing connections (A), (B), and (C), can be furnished in any desired length with suitable end fittings. A tank fitting (4) is furnished with the **Tank-O-Meter** and is provided with a stuffing box and stuffing box nut (6), through which a 1/2" pressure pipe (7) extends. The tank fitting (4) is also provided with a 1 1/2" male pipe thread for screwing into a 1 1/2" coupling (28). The pressure fitting (25), which is also furnished with the **Tank-O-Meter** is provided with a 1/2" female pipe thread so that it can be screwed fast to the top of the 1/2" pressure pipe (7). The pressure pipe (7) may be made of a standard 1/2" pipe of the material best suited for the liquid involved. For very viscous liquids, pipe (7) may be made larger in diameter. It is generally recommended that the pressure pipe (7) be cut away at the bottom as illustrated by dimension (a). This eliminates any possible errors due to sludge in the bottom of the tank. The dimension (a) is generally two inches but may be made to suit the characteristics of the liquid involved. The starting point on the scale is determined by this dimension.

Tank fitting (4) and pressure fitting (25) can be furnished of steel, brass, aluminum, stainless steel, hard rubber, or any other material most suitable for the liquid involved.

ACTUATING MEANS

The air or gas for actuating the **Tank-O-Meter** may be supplied from any number of different sources. As already stated, the most generally used means for supplying air to the measuring system is a hand pump (2), Figure 17-A, which forms a part of the **Tank-O-Meter.** Only a few strokes of the pump are necessary to exhaust the pressure pipe (7), Figure 16, after which continued pumping will only cause air to bubble out at

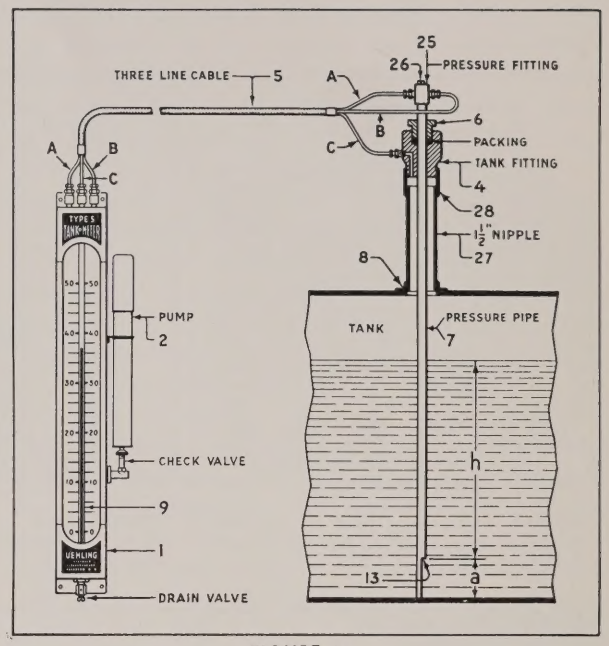


FIGURE 16

(13) without further affecting the reading as indicated by the manometer (9) of the **Tank-O-Meter.** A check valve as illustrated in Figure 16, maintains the reading thus obtained.

The **Tank-O-Meter** may also be actuated by compressed air. In such a case, the instrument is furnished with a bubbling chamber (3) and a needle valve (9), Figure 17-B. The compressed air supply line is connected through the needle valve which may be adjusted to cause a gentle bubbling visualized through the transparent vessel (3). The air thus supplied will exhaust the pressure pipe (7), Figure 16, and then continue to bubble out through (13), thereby causing the reading on the **Tank-O-Meter** to correspond to the head (h), Figure 16.

When the chemical properties of the liquid to be measured will not permit the use of air, any other more suitable gaseous medium may be substituted. In such a case, for example, the **Tank-O-Meter** may be actuated from a cylinder of inert gas, such as Nitrogen or Carbon Dioxide. This method is illustrated in Figure 17-C, in which a standard cylinder (7) is connected with the bubbling chamber (3) and needle valve (9) through a reducing valve (6). When the needle valve (9) is opened to cause the gentle bubbling in (3), the indicating fluid of the **Tank-O-Meter** will, in the manner previously stated, rise to the point corresponding to the level of the liquid in the tank. The indicating column will remain at this point even after the needle valve has been closed. It is, therefore, only necessary to open the needle valve until the maximum reading has been obtained. By this method of conserving gas, the cylinder (7) will be capable of supplying the required pressure for an indefinite period of time.

Any of the above actuating methods can be used in conjunction with a high or low level alarm as shown in Figure 17-D.

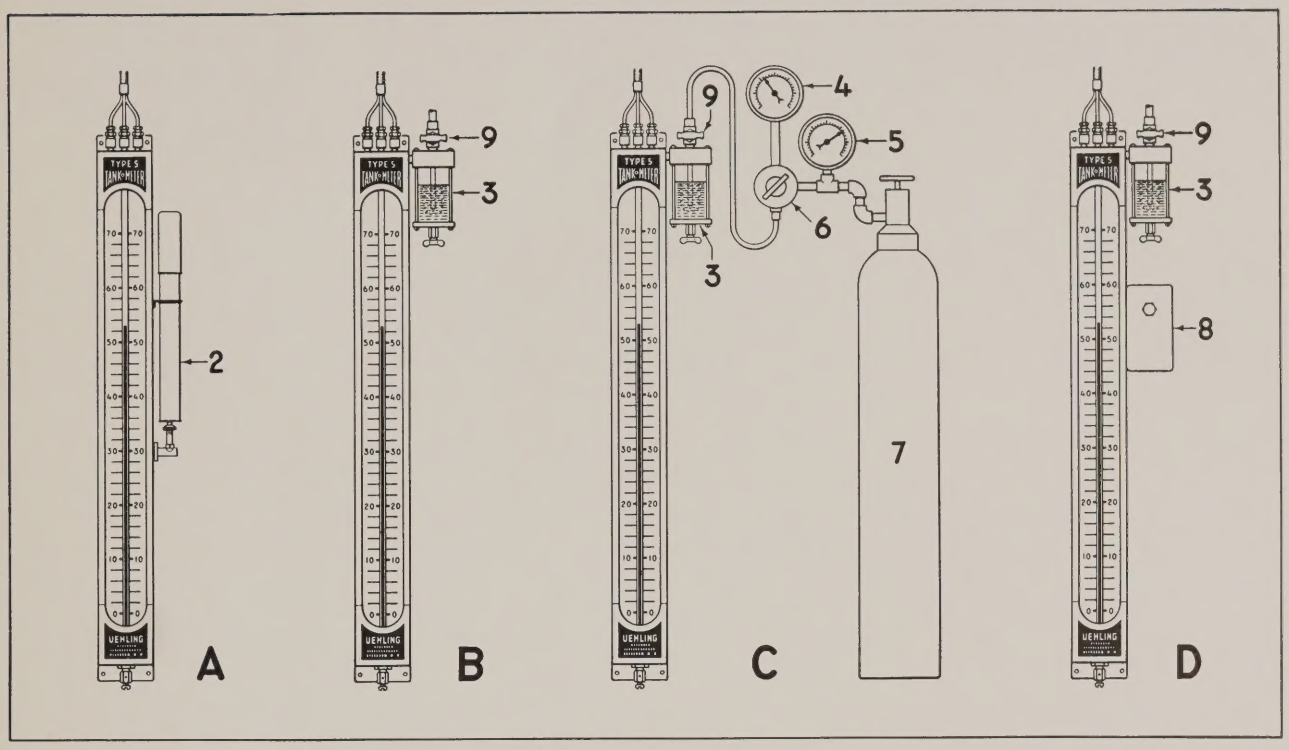


FIGURE 17—(A) Hand Pump Actuation, (B) Compressed Air Actuation, (C) Actuation by a Cylinder of Inert Gas, (D) Actuation by Compressed Air or Inert Gas with Switch for automatically opening or closing an electric circuit at any predetermined level.

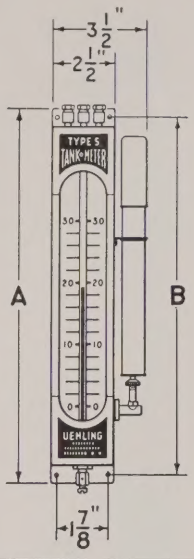
STANDARD MODELS AND CHARACTERISTICS*

Red Indicating Fluid No. 1			Red Indicating Fluid No. 3			Red Indicating Fluid No. 2			Mercury		
I	II	III	I	II	III	I	II	III	I	II	III
MODEL	Depth Inches Water	Approx. Scale Length in Inches	MODEL	Depth Inches Water	Approx. Scale Length in Inches	MODEL	Depth Inches Water	Approx. Scale Length in Inches	MODEL	Depth Inches Water	Approx. Scale Length in Inches
11R1	8.8	11	11R3	13.7	11	11R2	33	11	11MT	150	11
14R1	11.2	14	14R3	17.5	14	14R2	42	14	14MT	185	14
15R1	12.0	15	15R3	18.7	15	15R2	45	15	15MT	200	15
20R1	16.0	20	20R3	25.0	20	20R2	60	20	20MT	270	20
25R1	20.0	25	25R3	31.0	25	25R2	75	25	25MT	340	25
30R1	24.0	30	30R3	37.0	30	30R2	90	30	30MT	410	30
35R1	28.0	35	35R3	43.0	35	35R2	105	35	35MT	480	35
40R1	32.0	40	40R3	50.0	40	40R2	120	40	40MT	550	40
45R1	36.0	45	45R3	56.0	45	45R2	135	45	45MT	620	45
50R1	40.0	50	50R3	62.0	50	50R2	150	50	50MT	690	50
55R1	44.0	55	55R3	68.0	55	55R2	165	55	55MT	750	55
60R1	48.0	60	60R3	75.0	60	60R2	180	60	60MT	820	60
65R1	52.0	65	65R3	81.0	65	65R2	194	65	65MT	890	65
70R1	56.0	70	70R3	88.0	70	70R2	209	70	70MT	960	70
75R1	60.0	75	75R3	94.0	75	75R2	224	75	75MT	1020	75
80R1	64.0	80	80R3	101.0	80	80R2	239	80	80MT	1090	80
85R1	68.0	85	85R3	108.0	85	85R2	253	85	85MT	1160	85
90R1	72.0	90	90R3	114.0	90	90R2	268	90	90MT	1230	90
95R1	76.0	95	95R3	119.0	95	95R2	283	95	95MT	1290	95
100R1	80.0	100	100R3	125.0	100	100R2	298	100	100MT	1360	100

*To determine Model for any particular Tank multiply the maximum depth of tank in inches by the specific gravity of the Liquid. The smallest figure in Column II which is equal to or greater than the figure so obtained will determine the model of TANK-O-METER required.

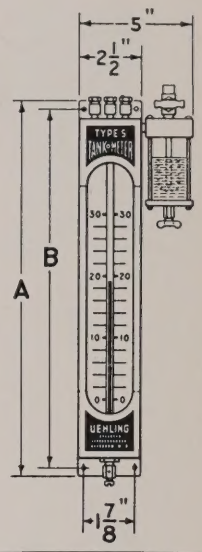
FOR OVERALL DIMENSIONS SEE BACK COVER

OVERALL TANK-O-METER DIMENSIONS



Hand Pump Actuated

MODELS	Dimension A	Dimension B
11R1, 11R2, 11R3, and 11MT	18 1/4 inches	17 1/2 inches
14R1, 14R2, 14R3, and 14MT	21 "	20 1/4 "
15R1, 15R2, 15R3, and 15MT	22 1/4 "	21 1/2 "
20R1, 20R2, 20R3, and 20MT	27 1/4 "	26 1/2 "
25R1, 25R2, 25R3, and 25MT	32 1/4 "	31 1/2 "
30R1, 30R2, 30R3, and 30MT	37 1/4 "	36 1/2 "
35R1, 35R2, 35R3, and 35MT	42 1/4 "	41 1/2 "
40R1, 40R2, 40R3, and 40MT	47 1/4 "	46 1/2 "
45R1, 45R2, 45R3, and 45MT	52 1/4 "	51 1/2 "
50R1, 50R2, 50R3, and 50MT	57 1/4 "	56 1/2 "
55R1, 55R2, 55R3, and 55MT	62 1/4 "	61 1/2 "
60R1, 60R2, 60R3, and 60MT	67 1/4 "	66 1/2 "
65R1, 65R2, 65R3, and 65MT	72 1/4 "	71 1/2 "
70R1, 70R2, 70R3, and 70MT	77 1/4 "	76 1/2 "
75R1, 75R2, 75R3, and 75MT	82 1/4 "	81 1/2 "
80R1, 80R2, 80R3, and 80MT	87 1/4 "	86 1/2 "
85R1, 85R2, 85R3, and 85MT	92 1/4 "	91 1/2 "
90R1, 90R2, 90R3, and 90MT	97 1/4 "	96 1/2 "
95R1, 95R2, 95R3, and 95MT	102 1/4 "	101 1/2 "
100R1, 100R2, 100R3, and 100MT	107 1/4 "	106 1/2 "



Compressed Air Actuated

OTHER UEHLING PRODUCTS

Apex CO_2 Recorders and Indicators
Combined Barometer and Vacuum Recorders
Vacuum Recorders
Draft Recorders
Pressure Recorders
Absolute Pressure Indicators
Vacuum Indicators
Pressure Indicators
Combined Vacuum and Pressure Indicators
Barometers (Mercurial Type)
Draft Gauges
Manometers for any purpose

UEHLING INSTRUMENT COMPANY

Telephone 742-8710 PATERSON 3, NEW JERSEY